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SOUTH AMERICA

Reise in Peru und Ecuador ausgeführt 1909 von Wilhelm Sievers.

411 pp. Maps, illus., index. *Wissenschaftl. Veröffentl. der Gesell. für Erdk. zu Leipzig*, Vol. 8. 1914. 9½ x 6½.

A detailed description of observations made on a journey through northern Peru in 1909. The observations relate chiefly to (1) the lithologic and topographic characters of the various Cordilleras and Sierras between southern Ecuador and latitude 11° S. (Cerro de Pasco); (2) the glaciation of the Andean system between these limits; (3) the climate; (4) the distribution of the vegetation with special reference to the limits of the several types; (5) the distribution of useful plants; and (6) trade regions and transportation routes.

There is no better summary of the orogeny of northern Peru than that on the first eleven pages of this book. The detailed descriptions that follow will be a source of precise physiographic data for all time. It is dry reading, but we do not have in our literature a better method for the mere recording of scientific facts. The section on glaciation is the climax of the book. The colored map showing the limits of both existing and earlier ice sheets is in every respect praiseworthy. From it there flow conclusions of the highest importance. It is shown that the marks of glaciation on the eastern border of the Cordillera extend northward almost to the frontier and that the ice everywhere gave rise to mountain lakes of great value as feeders of streams that support irrigation. Between 7° and 8° S., at 10°, and again at 11°, the ice masses were coextensive with ample stretches of the summit plateau, giving rise to the type known as "plateau-glacier," already identified by Benrath (1904) and Hauthal. The map showing the distribution of this type of glacier is immensely instructive, no less in human geography (distribution of towns) than in physiography (distribution of ancient ice masses and glacial lakes).

The troublesome questions of the number of glaciations in South America, their relative effects and the limits of their action are treated in a conservative way. The author does not agree with Hauthal's conclusions (1911) regarding three glacial epochs. Of the existence of two epochs there is no longer reasonable doubt. Nearly equal in interest is the discussion of the limits of both present and past glaciations on the eastern and western borders of the Andes and of the individual ranges. The western slopes, oddly enough, appear to have the lower snow-line. The position of the snow-line is a function of temperature, precipitation, wind, and topography. On the west is a cool oceanic current and subnormal temperatures, hence a lower snow-line. Moreover, though the precipitation is greater on the east, it is partly offset by the warmer winds of the east, the dominant trades. Finally, the slopes fall off steeply on the east and less steeply, or to high plateau levels, on the west. There is need for further analysis. The problem is by no means solved. For, contrariwise, in Bolivia and southern Peru the snow-line is unquestionably canted eastward over the Cordillera as a whole and on the separate sierras. In the horse-latitude belt of northwestern Argentina it is no less true than in the trade-wind belt farther north. The width of the mountain belt is probably also a factor, the narrower zone of northern Peru allowing at least the occasional transmission of marine influences to the crest of the Andes.

The chapters on plant societies and the useful plants are refreshingly clear. There is a simplicity and directness of statement about highly important facts that leave the impression of modesty and of large reserve of power. Here are enormous quantities of the material of geography. There is almost too little attempt to cast into literary form the compact field notes of the author. These considerations apply with equal force to the valuable notes on the ways and means of trade and transportation. It is interesting to note that the highest shepherds' huts are in many places above the lower limits of glaciers, though nowhere are such extreme altitudes reached as the reviewer found in 1911 in southern Peru—17,100 feet, the highest habitations in the world yet reported.

ISAIAH BOWMAN.